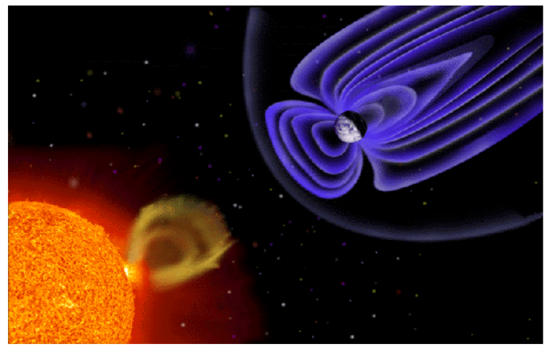
Solar Mass Ejection Imager

The Solar Mass Ejection Imager (SMEI) is an all-sky camera experiment capable of imaging coronal mass ejections (CME) propagating from the Sun through the solar wind. Successful operation of the SMEI will accomplish a major step in improving space weather forecasts. Detection of potentially damaging Earth-bound CMEs will help protect space assets and maintain stable communications (both capabilities that are vital to the warfighter). SMEI's all-sky images will also greatly aid astronomers and astrophysicists in understanding solar processes and detecting astronomical phenomena. SMEI will be able to observe near-earth objects and extra-solar planetary transits. SMEI will be launched into a sun-synchronous (830 km) orbit as part of the Space Test Program's Coriolis Mission in December, 2002.

A geomagnetic storm initiates a wide variety of effects adverse to military and civilian spacecraft and ground-based systems. These include increases in trapped magnetospheric particles, degraded satellite communication and surveillance systems, increased drag and deterioration of satellite altitude control, and destructive surges in power grids. CMEs consist of solar plasma and embedded magnetic fields traveling up to 1000 km/s (2 million miles/hour). Advanced warning of such storms would permit initiation of preventive measures to mitigate these effects. At present, prediction of even



Courtesy of Steele Hill - NASA and the International Solar Terrestrial Program

moderate geomagnetic storms is difficult. SMEI will obtain one- to three-day forecasts of geomagnetic storms by tracking CMEs from the Sun to near-Earth space.

In order to distinguish CMEs from the bright celestial background, SMEI will need to achieve 0.1% photometry. The experiment will image the entire sky in white light once per spacecraft orbit, about every 100 minutes, using baffled camera components with charge couple device (CCD) sensors. All-sky images will be made available on the web approximately one year after launch.

The major subsystems of SMEI are an electronic camera assembly that consists of three camera components and a data-handling unit. Each electronic camera component consists of a baffle, radiator, bright

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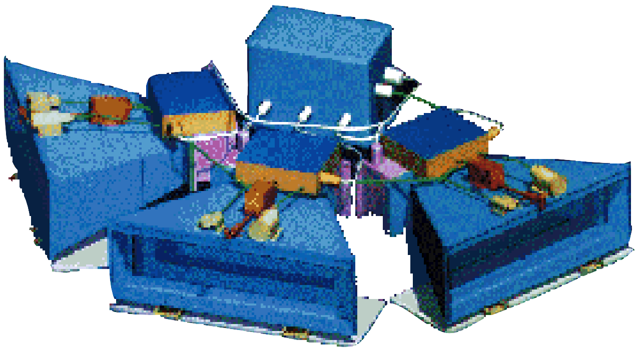

object sensor, strongbox (CCD, mirrors and shutter) and electronics box. The total mass of SMEI is 36 kg, and it uses an average of 38 watts of power.

The Space Test Program selected SMEI as a secondary payload for the Coriolis Mission. The critical design review was held in August 1999. The experiment was flight qualified the following year and was delivered for payload integration on the Coriolis spacecraft in April 2001. It will be launched in December, 2002.

The SMEI experiment was designed and constructed by a team of scientists and engineers primarily from the Air Force Research Laboratory, the University of California at San Diego, and the University of Birmingham in the United Kingdom. NASA, the United States Air Force, and the University of Birmingham are providing financial support for SMEI.

Current as of October 2002